

DaimlerChrysler AG

Patent claims

1. A method for energy management of air-conditioning units in motor vehicles, in particular air-conditioning units having a plurality of air-conditioning compressors, characterized by the steps

(step S1) allocation of priorities to each of at least two air-conditioning compressors of at least one air-conditioning unit,

(step S2a) interrogation whether an engine of the motor vehicle is newly started,

(step S2b) interrogation whether the engine is in the idling mode, and (step S2c) interrogation whether the engine or drive is in the full load mode and therefore an acceleration bit by which the air-conditioning compressors have been switched off is set,

(step S3) if all the interrogations in steps S2a to S2c have received a negative response, execution of a conventional regulating process of the air-conditioning unit, and

(steps S4 to S20) if one of the interrogations in the steps 2a to 2c has received a positive response, actuation of the air-conditioning compressors in the priority sequence allocated in step S1, with the actuation of each of the individual air-conditioning compressors being carried out offset by a time (T).

2. The method for energy management of air-conditioning units in motor vehicles as claimed in claim 1, characterized in that the respective predefined time (T) is dependent on a design, size, ambient temperature and/or a coolant pressure of the air-conditioning compressor.

3. The method for energy management of air-conditioning units in motor vehicles as claimed in claim 1 or 2, characterized in that the predefined time (T) is approximately 3 seconds.

4. The method for energy management of air-conditioning units in motor vehicles as claimed in one of the preceding claims 1 to 3, characterized in that the allocation of the priority in step S1 is carried out in such a way that an air-conditioning compressor which is assigned to a front vehicle region is allocated a higher priority than an air-conditioning compressor which is assigned to a rear vehicle region.

5. The method for energy management of air-conditioning units in motor vehicles as claimed in one of the preceding claims 1 to 4, characterized in that

(step S6) if it is detected in step S2b that the engine is in the idling mode it is checked whether an air-conditioning unit request signal is present,

(step S7) if the air-conditioning unit request signal is present in step S6, an air-conditioning compressor actuating signal (Komp_Stell) and an anticipated air-conditioning compressor torque (M_KOMP) are simultaneously output to an engine control device,

(step S8) the engine control device calculates a load increase signal (L) as a function of the air-conditioning compressor torque (M_KOMP) and outputs it to the engine after a predetermined time (T3), and

(step S9) a compressor flow which corresponds to the load increase signal (L) is output with a switch-on delay time (T1) by the engine to the air-conditioning compressor, wherein the steps S6 to S9 are firstly carried out for the air-conditioning compressor with the highest priority, and then after a predefined time T for the air-conditioning compressor with the next lowest priority.

6. The method for energy management of air-conditioning units for motor vehicles as claimed in claim 5, characterized in that

(step S10) during the switch-on delay time (T1) it is checked whether a deactivating switch for deactivation of the air-conditioning unit has been operated,

(step S11) if the result in step S10 revealed operation of the deactivating switch, all the air-conditioning compressors of the associated cooling circuit are switched off and the system returns to step S2a, otherwise when an air-conditioning compressor with the next lowest priority is present the sequence returns to step S7, otherwise to step S2a.

7. The method for energy management of air-conditioning units for motor vehicles as claimed in one of the preceding claims 1 to 6, characterized in that

(step S16, S17) if it is determined in step S2c that the acceleration bit is set, the air-conditioning compressor is switched off over a predetermined time period (T4, T4*),

(step S16a, S17a) monitoring is carried out to determine whether the acceleration bit is still set,

(step S18) if the acceleration bit is no longer set in step S16a or S17a, the air-conditioning compressor speeds up immediately with a predefined gradient,

(step S19, S20) if the acceleration bit is still set in step S16a or S17a, the deactivation of the air-conditioning compressor of the predetermined time period is ended and the air-conditioning compressor is powered up again with the predefined gradient,

with the steps S16 to S20 being repeated for the air-conditioning compressor with the next lowest priority.

8. The method for energy management of air-conditioning units for motor vehicles as claimed in claim 7, characterized in that

(step S14, S15) the external temperature (tA*) is determined before the step S16 and it is decided whether the determined external temperature (tA*) is above a predetermined threshold value (tA*th),

(step S16, S17) the predetermined time period (T4, T4*) is selected as a function of whether the external temperature (tA*) is above or below the threshold value (tA*th), and

(step S18, S19, S20) the gradient during the speeding up or powering up of the air-conditioning compressor is dependent on the result of the determination in step S15.

9. The method for energy management of air-conditioning units for motor vehicles as claimed in one of the preceding claims 1 to 8, characterized in that the steps S2a, S2b, S2c are carried out in a different sequence or simultaneously.